



ATTY DOCUMENT NO. UMG-052 (formerly 07917-105001)

SEQUENCE LISTING

RECEIVED
JUN 06 2003
TECH CENTER 1600/2900

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Tabara, Hiroaki
Grishok, Alla
Fire, Andrew

<120> RNA INTERFERENCE PATHWAY GENES AS TOOLS FOR TARGETED GENETIC
INTERFERENCE

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<140> US 09/689,992

<141> 2000-10-13

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<151> 2000-03-30

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 Gly Ile Gly Arg Phe Glu Ile Ala Ala Thr Glu Ala Lys Asn Met Phe
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 Glu Arg Leu Pro Asp Lys Glu Gln Lys Val Leu Met Phe Ile Ile Ile
 610 615 620
 Ser Lys Arg Gln Leu Asn Ala Tyr Gly Phe Val Lys His Tyr Cys Asp
 625 630 635 640
 His Thr Ile Gly Val Ala Asn Gln His Ile Thr Ser Glu Thr Val Thr
 645 650 655
 Lys Ala Leu Ala Ser Leu Arg His Glu Lys Gly Ser Lys Arg Ile Phe
 660 665 670
 Tyr Gln Ile Ala Leu Lys Ile Asn Ala Lys Leu Gly Gly Ile Asn Gln
 675 680 685
 Glu Leu Asp Trp Ser Glu Ile Ala Glu Ile Ser Pro Glu Glu Lys Glu
 690 695 700
 Arg Arg Lys Thr Met Pro Leu Thr Met Tyr Val Gly Ile Asp Val Thr
 705 710 715 720
 His Pro Thr Ser Tyr Ser Gly Ile Asp Tyr Ser Ile Ala Ala Val Val
 725 730 735
 Ala Ser Ile Asn Pro Gly Gly Thr Ile Tyr Arg Asn Met Ile Val Thr
 740 745 750
 Gln Glu Glu Cys Arg Pro Gly Glu Arg Ala Val Ala His Gly Arg Glu
 755 760 765
 Arg Thr Asp Ile Leu Glu Ala Lys Phe Val Lys Leu Leu Arg Glu Phe
 770 775 780
 Ala Glu Asn Asn Asp Asn Arg Ala Pro Ala His Ile Val Val Tyr Arg
 785 790 795 800
 Asp Gly Val Ser Asp Ser Glu Met Leu Arg Val Ser His Asp Glu Leu
 805 810 815
 Arg Ser Leu Lys Ser Glu Val Lys Gln Phe Met Ser Glu Arg Asp Gly
 820 825 830
 Glu Asp Pro Glu Pro Lys Tyr Thr Phe Ile Val Ile Gln Lys Arg His
 835 840 845

Asn	Thr	Arg	Leu	Leu	Arg	Arg	Met	Glu	Lys	Asp	Lys	Pro	Val	Val	Asn
850						855					860				
Lys	Asp	Leu	Thr	Pro	Ala	Glu	Thr	Asp	Val	Ala	Val	Ala	Ala	Val	Lys
865					870					875					880
Gln	Trp	Glu	Glu	Asp	Met	Lys	Glu	Ser	Lys	Glu	Thr	Gly	Ile	Val	Asn
				885					890					895	
Pro	Ser	Ser	Gly	Thr	Thr	Val	Asp	Lys	Leu	Ile	Val	Ser	Lys	Tyr	Lys
			900					905					910		
Phe	Asp	Phe	Phe	Leu	Ala	Ser	His	His	Gly	Val	Leu	Gly	Thr	Ser	Arg
	915						920					925			
Pro	Gly	His	Tyr	Thr	Val	Met	Tyr	Asp	Asp	Lys	Gly	Met	Ser	Gln	Asp
930						935					940				
Glu	Val	Tyr	Lys	Met	Thr	Tyr	Gly	Leu	Ala	Phe	Leu	Ser	Ala	Arg	Cys
945					950					955					960
Arg	Lys	Pro	Ile	Ser	Leu	Pro	Val	Pro	Val	His	Tyr	Ala	His	Leu	Ser
				965					970					975	
Cys	Glu	Lys	Ala	Lys	Glu	Leu	Tyr	Arg	Thr	Tyr	Lys	Glu	His	Tyr	Ile
			980					985					990		
Gly	Asp	Tyr	Ala	Gln	Pro	Arg	Thr	Arg	His	Glu	Met	Glu	His	Phe	Leu
	995					1000						1005			
Gln	Thr	Asn	Val	Lys	Tyr	Pro	Gly	Met	Ser	Phe	Ala				
1010						1015					1020				

<210> 4
 <211> 1222
 <212> DNA
 <213> Caenorhabditis elegans

<400> 4

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aagaaaactc	ccctcatggt	actagaagag	gctgctaagg	ctgtctatca	aaagacgcca	180
acttggggca	ctgtcgaact	tcttgaaggc	ttcgagatga	cgttgattct	gaatgaaatt	240
actgtaaaag	gccaggcaac	aagcaagaaa	gctgcgagac	aaaaggctgc	tgttgaatat	300
ttacgcaagg	ttgtggagaa	aggaaagcac	gaaatctttt	tcattcctgg	aacaaccaa	360
gaagaagctc	tttcgaatat	tgatcaaata	tcggataagg	ctgaggaatt	gaaacgatca	420
acttcagatg	ctgttcagga	taacgataac	gatgattcga	ttcctacaag	tgctgaattt	480
ccacctggta	tttcgccaac	cgagaattgg	gtcggaaagt	tgcaggaaaa	atctcaaaaa	540
agcaagctgc	aagccccaat	ctatgaagat	tccaagaatg	agagaaccga	gcgtttcttg	600
gttatatgca	cgatgtgcaa	tcaaaaaacc	agaggaatca	gaagtaagaa	gaaggacgca	660
aagaatcttg	cagcatgggt	gatgtggaaa	gcgttggaag	acggtatcga	atctctggaa	720
tcatatgata	tggttgatgt	gattgaaaat	ttggaagaag	ctgaacattt	actcgaaatt	780
caggatcaag	catccaagat	taaagacaag	cattccgcac	tgattgatat	actctcggac	840
aagaaaagat	tttcagacta	cagcatggat	ttcaacgtat	tatcagttag	cacaatggga	900
atacatcagg	tgctattgga	aatctcgttc	cggcgtctag	tttctccaga	ccccgacgat	960
ttggaaatgg	gagcagaaca	caccagact	gaagaaatta	tgaaggctac	tgccgagaag	1020
gaaaagctac	ggaagaagaa	tatgccagat	tccggggccgc	tagtgtttgc	tgacatgggt	1080
tcacggtcgg	aagaggctaa	acagtgtgct	tgtaaatacgg	cgattatcca	tttcaacacc	1140
tatgatttca	cggattgaaa	atattattgc	gtattcctga	aaaatgaagc	gtctgaatga	1200
ttataaaaaa	aaaaaaaaaa	aa				1222

<210> 5
 <211> 407
 <212> PRT
 <213> Caenorhabditis elegans

<220>
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 <222> (1)...(407)
 <223> Xaa = Any Amino Acid

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 Arg Thr Asp Leu Glu Met Phe Leu Lys Lys Thr Pro Leu Met Val Leu
 35 40 45
 Glu Glu Ala Ala Lys Ala Val Tyr Gln Lys Thr Pro Thr Trp Gly Thr
 50 55 60
 Val Glu Leu Pro Glu Gly Phe Glu Met Thr Leu Ile Leu Asn Glu Ile
 65 70 75 80
 Thr Val Lys Gly Gln Ala Thr Ser Lys Lys Ala Ala Arg Gln Lys Ala
 85 90 95
 Ala Val Glu Tyr Leu Arg Lys Val Val Glu Lys Gly Lys His Glu Ile
 100 105 110
 Phe Phe Ile Pro Gly Thr Thr Lys Glu Glu Ala Leu Ser Asn Ile Asp
 115 120 125
 Gln Ile Ser Asp Lys Ala Glu Glu Leu Lys Arg Ser Thr Ser Asp Ala
 130 135 140
 Val Gln Asp Asn Asp Asn Asp Asp Ser Ile Pro Thr Ser Ala Glu Phe
 145 150 155 160
 Pro Pro Gly Ile Ser Pro Thr Glu Asn Trp Val Gly Lys Leu Gln Glu
 165 170 175
 Lys Ser Gln Lys Ser Lys Leu Gln Ala Pro Ile Tyr Glu Asp Ser Lys
 180 185 190
 Asn Glu Arg Thr Glu Arg Phe Leu Val Ile Cys Thr Met Cys Asn Gln
 195 200 205
 Lys Thr Arg Gly Ile Arg Ser Lys Lys Lys Asp Ala Lys Asn Leu Ala
 210 215 220
 Ala Trp Leu Met Trp Lys Ala Leu Glu Asp Gly Ile Glu Ser Leu Glu
 225 230 235 240
 Ser Tyr Asp Met Val Asp Val Ile Glu Asn Leu Glu Glu Ala Glu His
 245 250 255
 Leu Leu Glu Ile Gln Asp Gln Ala Ser Lys Ile Lys Asp Lys His Ser
 260 265 270
 Ala Leu Ile Asp Ile Leu Ser Asp Lys Lys Arg Phe Ser Asp Tyr Ser
 275 280 285
 Met Asp Phe Asn Val Leu Ser Val Ser Thr Met Gly Ile His Gln Val
 290 295 300
 Leu Leu Glu Ile Ser Phe Arg Arg Leu Val Ser Pro Asp Pro Asp Asp
 305 310 315 320
 Leu Glu Met Gly Ala Glu His Thr Gln Thr Glu Glu Ile Met Lys Ala
 325 330 335
 Thr Ala Glu Lys Glu Lys Leu Arg Lys Lys Asn Met Pro Asp Ser Gly
 340 345 350
 Pro Leu Val Phe Ala Gly His Gly Ser Ser Ala Glu Glu Ala Lys Gln
 355 360 365
 Cys Ala Cys Lys Ser Ala Ile Ile His Phe Asn Thr Tyr Asp Phe Thr
 370 375 380
 Asp Xaa Lys Tyr Tyr Cys Val Phe Leu Lys Asn Glu Ala Ser Glu Xaa
 385 390 395 400
 Leu Xaa Lys Lys Lys Lys
 405

<210> 6
 <211> 763
 <212> PRT
 <213> Arabidopsis thaliana

<400> 6
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 Lys Phe Val Ala Arg Ala Asn Met His His Leu Gly Glu Phe Leu Ala
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 Gly Lys Arg Ala Asp Cys Pro Gln Glu Ala Val Gln Ile Leu Asp Ile
 35 40 45
 Val Leu Arg Glu Leu Ser Val Lys Arg Phe Cys Pro Val Gly Arg Ser
 50 55 60
 Phe Phe Ser Pro Asp Ile Lys Thr Pro Gln Arg Leu Gly Glu Gly Leu
 65 70 75 80
 Glu Ser Trp Cys Gly Phe Tyr Gln Ser Ile Arg Pro Thr Gln Met Gly
 85 90 95
 Leu Ser Leu Asn Ile Asp Met Ala Ser Ala Ala Phe Ile Glu Pro Leu
 100 105 110
 Pro Val Ile Glu Phe Val Ala Gln Leu Leu Gly Lys Asp Val Leu Ser
 115 120 125
 Lys Pro Leu Ser Asp Ser Asp Arg Val Lys Ile Lys Lys Gly Leu Arg
 130 135 140
 Gly Val Lys Val Glu Val Thr His Arg Ala Asn Val Arg Arg Lys Tyr
 145 150 155 160
 Arg Val Ala Gly Leu Thr Thr Gln Pro Thr Arg Glu Leu Met Phe Pro
 165 170 175
 Val Asp Glu Asn Cys Thr Met Lys Ser Val Ile Glu Tyr Phe Gln Glu
 180 185 190
 Met Tyr Gly Phe Thr Ile Gln His Thr His Leu Pro Cys Leu Gln Val
 195 200 205
 Gly Asn Gln Lys Lys Ala Ser Tyr Leu Pro Met Glu Ala Cys Lys Ile
 210 215 220
 Val Glu Gly Gln Arg Tyr Thr Lys Arg Leu Asn Glu Lys Gln Ile Thr
 225 230 235 240
 Ala Leu Leu Lys Val Thr Cys Gln Arg Ala Glu Gly Gln Arg Asn Asp
 245 250 255
 Ile Leu Arg Thr Val Gln His Asn Ala Tyr Asp Gln Asp Pro Tyr Ala
 260 265 270
 Lys Glu Phe Gly Met Asn Ile Ser Glu Lys Leu Ala Ser Val Glu Ala
 275 280 285
 Arg Ile Leu Pro Ala Pro Trp Leu Lys Tyr His Glu Asn Gly Lys Glu
 290 295 300
 Lys Asp Cys Leu Pro Gln Val Gly Gln Trp Asn Met Met Asn Lys Lys
 305 310 315 320
 Met Ile Asn Gly Met Thr Val Ser Arg Trp Ala Cys Val Asn Phe Ser
 325 330 335
 Arg Ser Val Gln Glu Asn Val Ala Arg Gly Phe Cys Asn Glu Leu Gly
 340 345 350
 Gln Met Cys Glu Val Ser Gly Met Glu Phe Asn Pro Glu Pro Val Ile
 355 360 365
 Pro Ile Tyr Ser Ala Arg Pro Asp Gln Val Glu Lys Ala Leu Lys His
 370 375 380
 Val Tyr His Thr Ser Met Asn Lys Thr Lys Gly Lys Glu Leu Glu Leu
 385 390 395 400
 Leu Leu Ala Ile Leu Pro Asp Asn Asn Gly Ser Leu Tyr Gly Asp Leu
 405 410 415
 Lys Arg Ile Cys Glu Thr Glu Leu Gly Leu Ile Ser Gln Cys Cys Leu
 420 425 430
 Thr Lys His Val Phe Lys Ile Ser Lys Gln Tyr Leu Ala Asp Val Ser
 435 440 445
 Leu Lys Ile Asn Val Lys Met Gly Gly Arg Asn Thr Val Leu Val Asp
 450 455 460
 Ala Ile Ser Cys Arg Ile Pro Leu Val Ser Asp Ile Pro Thr Ile Ile
 465 470 475 480

Phe Gly Ala Asp Val Thr His Pro Glu Asn Gly Glu Glu Ser Ser Pro
485 490 495
Ser Ile Ala Ala Val Val Ala Ser Gln Asp Trp Pro Glu Val Thr Lys
500 505 510
Tyr Ala Gly Leu Val Cys Ala Gln Ala His Arg Gln Glu Leu Ile Gln
515 520 525
Asp Leu Tyr Lys Thr Trp Gln Asp Pro Val Arg Gly Thr Val Ser Gly
530 535 540
Gly Met Ile Arg Asp Leu Leu Ile Ser Phe Arg Lys Ala Thr Gly Gln
545 550 555 560
Lys Pro Leu Arg Ile Ile Phe Tyr Arg Asp Gly Val Ser Glu Gly Gln
565 570 575
Phe Tyr Gln Val Leu Leu Tyr Glu Leu Asp Ala Ile Arg Lys Ala Cys
580 585 590
Ala Ser Leu Glu Pro Asn Tyr Gln Pro Pro Val Thr Phe Ile Val Val
595 600 605
Gln Lys Arg His His Thr Arg Leu Phe Ala Asn Asn His Arg Asp Lys
610 615 620
Asn Ser Thr Asp Arg Ser Gly Asn Ile Leu Pro Gly Thr Val Val Asp
625 630 635 640
Thr Lys Ile Cys His Pro Thr Glu Phe Asp Phe Tyr Leu Cys Ser His
645 650 655
Ala Gly Ile Gln Gly Thr Ser Arg Pro Ala His Tyr His Val Leu Trp
660 665 670
Asp Glu Asn Asn Phe Thr Ala Asp Gly Ile Gln Ser Leu Thr Asn Asn
675 680 685
Leu Cys Tyr Thr Tyr Ala Arg Cys Thr Arg Ser Val Ser Ile Val Pro
690 695 700
Pro Ala Tyr Tyr Ala His Leu Ala Ala Phe Arg Ala Arg Phe Tyr Leu
705 710 715 720
Glu Pro Glu Ile Met Gln Asp Asn Gly Ser Pro Gly Lys Lys Asn Thr
725 730 735
Lys Thr Thr Thr Val Gly Asp Val Gly Val Lys Pro Leu Pro Ala Leu
740 745 750
Lys Glu Asn Val Lys Arg Val Met Phe Tyr Cys
755 760

<210> 7

<211> 678

<212> PRT

<213> *Drosophila melanogaster*

<400> 7

Arg Ala Gly Glu Asn Ile Glu Ile Lys Ile Lys Ala Val Gly Ser Val
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Gln Ser Thr Asp Ala Glu Gln Phe Gln Val Leu Asn Leu Ile Leu Arg
20 25 30
Arg Ala Met Glu Gly Leu Asp Leu Lys Leu Val Ser Arg Tyr Tyr Tyr
35 40 45
Asp Pro Gln Ala Lys Ile Asn Leu Glu Asn Phe Arg Met Gln Leu Trp
50 55 60
Pro Gly Tyr Gln Thr Ser Ile Arg Gln His Glu Asn Asp Ile Leu Leu
65 70 75 80
Cys Ser Glu Ile Cys His Lys Val Met Arg Thr Glu Thr Leu Tyr Asn
85 90 95
Ile Leu Ser Asp Ala Ile Arg Asp Ser Asp Asp Tyr Gln Ser Thr Phe
100 105 110
Lys Arg Ala Val Met Gly Met Val Ile Leu Thr Asp Tyr Asn Asn Lys
115 120 125
Thr Tyr Arg Ile Asp Asp Val Asp Phe Gln Ser Thr Pro Leu Cys Lys
130 135 140

Phe	Lys	Thr	Asn	Asp	Gly	Glu	Ile	Ser	Tyr	Val	Asp	Tyr	Tyr	Lys	Lys	145	150	155	160
Arg	Tyr	Asn	Ile	Ile	Ile	Arg	Asp	Leu	Lys	Gln	Pro	Leu	Val	Met	Ser	165	170	175	
Arg	Pro	Thr	Asp	Lys	Asn	Ile	Arg	Gly	Gly	Asn	Asp	Gln	Ala	Ile	Met	180	185	190	
Ile	Ile	Pro	Glu	Leu	Ala	Arg	Ala	Thr	Gly	Met	Thr	Asp	Ala	Met	Arg	195	200	205	
Ala	Asp	Phe	Arg	Thr	Leu	Arg	Ala	Met	Ser	Glu	His	Thr	Arg	Leu	Asn	210	215	220	
Pro	Asp	Arg	Arg	Ile	Glu	Arg	Leu	Arg	Met	Phe	Asn	Lys	Arg	Leu	Lys	225	230	235	240
Ser	Cys	Lys	Gln	Ser	Val	Glu	Thr	Leu	Lys	Ser	Trp	Asn	Ile	Glu	Leu	245	250	255	
Asp	Ser	Ala	Leu	Val	Glu	Ile	Pro	Ala	Arg	Val	Leu	Pro	Pro	Glu	Lys	260	265	270	
Ile	Leu	Phe	Gly	Asn	Gln	Lys	Ile	Phe	Val	Cys	Asp	Ala	Arg	Ala	Asp	275	280	285	
Trp	Thr	Asn	Glu	Phe	Arg	Thr	Cys	Ser	Met	Phe	Lys	Asn	Val	His	Ile	290	295	300	
Asn	Arg	Trp	Tyr	Val	Ile	Thr	Pro	Ser	Arg	Asn	Leu	Arg	Glu	Thr	Gln	305	310	315	320
Glu	Phe	Val	Gln	Met	Cys	Ile	Arg	Thr	Ala	Ser	Ser	Met	Lys	Met	Asn	325	330	335	
Ile	Cys	Asn	Pro	Ile	Tyr	Glu	Glu	Ile	Pro	Asp	Asp	Arg	Asn	Gly	Thr	340	345	350	
Tyr	Ser	Gln	Ala	Ile	Asp	Asn	Ala	Ala	Ala	Asn	Asp	Pro	Gln	Ile	Val	355	360	365	
Met	Val	Val	Met	Arg	Ser	Pro	Asn	Glu	Glu	Lys	Tyr	Ser	Cys	Ile	Lys	370	375	380	
Lys	Arg	Thr	Cys	Val	Asp	Arg	Pro	Val	Pro	Ser	Gln	Val	Val	Thr	Leu	385	390	395	400
Lys	Val	Ile	Ala	Pro	Arg	Gln	Gln	Lys	Pro	Thr	Gly	Leu	Met	Ser	Ile	405	410	415	
Ala	Thr	Lys	Val	Val	Ile	Gln	Met	Asn	Ala	Lys	Leu	Met	Gly	Ala	Pro	420	425	430	
Trp	Gln	Val	Val	Ile	Pro	Leu	His	Gly	Leu	Met	Thr	Val	Gly	Phe	Asp	435	440	445	
Val	Cys	His	Ser	Pro	Lys	Asn	Lys	Asn	Lys	Ser	Tyr	Gly	Ala	Phe	Val	450	455	460	
Ala	Thr	Met	Asp	Gln	Lys	Glu	Ser	Phe	Arg	Tyr	Phe	Ser	Thr	Val	Asn	465	470	475	480
Glu	His	Ile	Lys	Gly	Gln	Glu	Leu	Ser	Glu	Gln	Met	Ser	Val	Asn	Met	485	490	495	
Ala	Cys	Ala	Leu	Arg	Ser	Tyr	Gln	Glu	Gln	His	Arg	Ser	Leu	Pro	Glu	500	505	510	
Arg	Ile	Leu	Phe	Phe	Arg	Asp	Gly	Val	Gly	Asp	Gly	Gln	Leu	Tyr	Gln	515	520	525	
Val	Val	Asn	Ser	Glu	Val	Asn	Thr	Leu	Lys	Asp	Arg	Leu	Asp	Glu	Ile	530	535	540	
Tyr	Lys	Ser	Ala	Gly	Lys	Gln	Glu	Gly	Cys	Arg	Met	Thr	Phe	Ile	Ile	545	550	555	560
Val	Ser	Lys	Arg	Ile	Asn	Ser	Arg	Tyr	Phe	Thr	Gly	His	Arg	Asn	Pro	565	570	575	
Val	Pro	Gly	Thr	Val	Val	Asp	Asp	Val	Ile	Thr	Leu	Pro	Glu	Arg	Tyr	580	585	590	
Asp	Phe	Phe	Leu	Val	Ser	Gln	Ala	Val	Arg	Ile	Gly	Thr	Val	Ser	Pro	595	600	605	
Thr	Ser	Tyr	Asn	Val	Ile	Ser	Asp	Asn	Met	Gly	Leu	Asn	Ala	Asp	Lys	610	615	620	

Leu Gln Met Leu Ser Tyr Lys Met Thr His Met Tyr Tyr Asn Tyr Ser
 625 630 635 640
 Gly Thr Ile Arg Val Pro Ala Val Cys His Tyr Ala His Lys Leu Ala
 645 650 655
 Phe Leu Val Ala Glu Ser Ile Asn Arg Ala Pro Ser Ala Gly Leu Gln
 660 665 670
 Asn Gln Leu Tyr Phe Leu
 675

<210> 8
 <211> 69
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Consensus sequence
 <221> VARIANT
 <222> (1)...(69)
 <223> Xaa = Any Amino Acid

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 Xaa Xaa Xaa Tyr Xaa Xaa Xaa Xaa Xaa Gly Pro Xaa His Xaa Xaa
 20 25 30
 Xaa Phe Xaa Xaa Xaa Val Xaa Xaa Xaa Gly Xaa Xaa Xaa Xaa Gly
 35 40 45
 Xaa Gly Xaa Ser Lys Lys Xaa Xaa Ala Lys Xaa Xaa Ala Ala Xaa Xaa
 50 55 60
 Ala Leu Xaa Xaa Leu
 65

<210> 9
 <211> 766
 <212> PRT
 <213> Caenorhabditis elegans

<400> 9
 Ser Ala Val Glu Arg Gln Phe Ser Val Ser Leu Lys Trp Val Gly Gln
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 Val Ser Leu Ser Thr Leu Glu Asp Ala Met Glu Gly Arg Val Arg Gln
 20 25 30
 Val Pro Phe Glu Ala Val Gln Ala Met Asp Val Ile Leu Arg His Leu
 35 40 45
 Pro Ser Leu Lys Tyr Thr Pro Val Gly Arg Ser Phe Phe Ser Pro Pro
 50 55 60
 Val Pro Asn Ala Ser Gly Val Met Ala Gly Ser Cys Pro Pro Gln Ala
 65 70 75 80
 Ser Gly Ala Val Ala Gly Gly Ala His Ser Ala Gly Gln Tyr His Ala
 85 90 95
 Glu Ser Lys Leu Gly Gly Gly Arg Glu Val Trp Phe Gly Phe His Gln
 100 105 110
 Ser Val Arg Pro Ser Gln Trp Lys Met Met Leu Asn Ile Asp Val Ser
 115 120 125
 Ala Thr Ala Phe Tyr Arg Ser Met Pro Val Ile Glu Phe Ile Ala Glu
 130 135 140
 Val Leu Glu Leu Pro Val Gln Ala Leu Ala Glu Arg Arg Ala Leu Ser
 145 150 155 160
 Asp Ala Gln Arg Val Lys Phe Thr Lys Glu Ile Arg Gly Leu Lys Ile
 165 170 175

Glu Ile Thr His Cys Gly Gln Met Arg Arg Lys Tyr Arg Val Cys Asn
 180 185 190
 Val Thr Arg Arg Pro Ala Gln Thr Gln Thr Phe Pro Leu Gln Leu Glu
 195 200 205
 Thr Gly Gln Thr Ile Glu Cys Thr Val Ala Lys Tyr Phe Tyr Asp Lys
 210 215 220
 Tyr Arg Ile Gln Leu Lys Tyr Pro His Leu Pro Cys Leu Gln Val Gly
 225 230 235 240
 Gln Glu Gln Lys His Thr Tyr Leu Pro Pro Glu Val Cys Asn Ile Val
 245 250 255
 Pro Gly Gln Arg Cys Ile Lys Lys Leu Thr Asp Val Gln Thr Ser Thr
 260 265 270
 Met Ile Lys Ala Thr Ala Arg Ser Ala Pro Glu Arg Glu Arg Glu Ile
 275 280 285
 Ser Asn Leu Val Arg Lys Ala Glu Phe Ser Ala Asp Pro Phe Ala His
 290 295 300
 Glu Phe Gly Ile Thr Ile Asn Pro Ala Met Thr Glu Val Lys Gly Arg
 305 310 315 320
 Val Leu Ser Ala Pro Lys Leu Leu Tyr Gly Gly Arg Thr Arg Ala Thr
 325 330 335
 Ala Leu Pro Asn Gln Gly Val Trp Asp Met Arg Gly Lys Gln Phe His
 340 345 350
 Thr Gly Ile Asp Val Arg Val Trp Ala Ile Ala Cys Phe Ala Gln Gln
 355 360 365
 Gln His Val Lys Glu Asn Asp Leu Arg Met Phe Thr Asn Gln Leu Gln
 370 375 380
 Arg Ile Ser Asn Asp Ala Gly Met Pro Ile Val Gly Asn Pro Cys Phe
 385 390 395 400
 Cys Lys Tyr Ala Val Gly Val Glu Gln Val Glu Pro Met Phe Lys Tyr
 405 410 415
 Leu Lys Gln Asn Tyr Ser Gly Ile Gln Leu Val Val Val Val Leu Pro
 420 425 430
 Gly Lys Thr Pro Val Tyr Ala Glu Val Lys Arg Val Gly Asp Thr Val
 435 440 445
 Leu Gly Ile Ala Thr Gln Cys Val Gln Ala Lys Asn Ala Ile Arg Thr
 450 455 460
 Thr Pro Gln Thr Leu Ser Asn Leu Cys Leu Lys Met Asn Val Lys Leu
 465 470 475 480
 Gly Gly Val Asn Ser Ile Leu Leu Pro Asn Val Arg Pro Arg Ile Phe
 485 490 495
 Asn Glu Pro Val Ile Phe Phe Gly Cys Asp Ile Thr His Pro Pro Ala
 500 505 510
 Gly Asp Ser Arg Lys Pro Ser Ile Ala Ala Val Val Gly Ser Met Asp
 515 520 525
 Ala His Pro Ser Arg Tyr Ala Ala Thr Val Arg Val Gln Gln His Arg
 530 535 540
 Gln Glu Ile Ile Ser Asp Leu Thr Tyr Met Val Arg Glu Leu Leu Val
 545 550 555 560
 Gln Phe Tyr Arg Asn Thr Arg Phe Lys Pro Ala Arg Ile Val Val Tyr
 565 570 575
 Arg Asp Gly Val Ser Glu Gly Gln Phe Phe Asn Val Leu Gln Tyr Glu
 580 585 590
 Leu Arg Ala Ile Arg Glu Ala Cys Met Met Leu Glu Arg Gly Tyr Gln
 595 600 605
 Pro Gly Ile Thr Phe Ile Ala Val Gln Lys Arg His His Thr Arg Leu
 610 615 620
 Phe Ala Val Asp Lys Lys Asp Gln Val Gly Lys Ala Tyr Asn Ile Pro
 625 630 635 640
 Pro Gly Thr Thr Val Asp Val Gly Ile Thr His Pro Thr Glu Phe Asp
 645 650 655

Phe Tyr Leu Cys Ser His Ala Gly Ile Gln Gly Thr Ser Arg Pro Ser
660 665 670
His Tyr His Val Leu Trp Asp Asp Asn Asn Leu Thr Ala Asp Glu Leu
675 680 685
Gln Gln Leu Thr Tyr Gln Met Cys His Thr Tyr Val Arg Cys Thr Arg
690 695 700
Ser Val Ser Ile Pro Ala Pro Ala Tyr Tyr Ala His Leu Val Ala Phe
705 710 715 720
Arg Ala Arg Tyr His Leu Val Asp Arg Glu His Asp Ser Gly Glu Gly
725 730 735
Ser Gln Pro Ser Gly Thr Ser Glu Asp Thr Thr Leu Ser Asn Met Ala
740 745 750
Arg Ala Val Gln Val Ile Leu Ala Phe Asn Leu Val Ser Ile
755 760 765

<210> 10
<211> 737
<212> PRT
<213> Oryctolagus cuniculus

<400> 10
Gly Lys Asp Arg Ile Phe Lys Val Ser Ile Lys Trp Val Ser Cys Val
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Ser Leu Gln Ala Leu His Asp Ala Leu Ser Gly Arg Leu Pro Ser Val
20 25 30
Pro Phe Glu Thr Ile Gln Ala Leu Asp Val Val Met Arg His Leu Pro
35 40 45
Ser Met Arg Tyr Thr Pro Val Gly Arg Ser Phe Phe Thr Ala Ser Glu
50 55 60
Gly Cys Ser Asn Pro Leu Gly Gly Gly Arg Glu Val Trp Phe Gly Phe
65 70 75 80
His Gln Ser Val Arg Pro Ser Leu Trp Lys Met Met Leu Asn Ile Asp
85 90 95
Val Ser Ala Thr Ala Phe Tyr Lys Ala Gln Pro Val Ile Glu Phe Val
100 105 110
Cys Glu Val Leu Asp Phe Lys Ser Ile Glu Glu Gln Gln Lys Pro Leu
115 120 125
Thr Asp Ser Gln Arg Val Lys Phe Thr Lys Glu Ile Lys Gly Leu Lys
130 135 140
Val Glu Ile Thr His Cys Gly Gln Met Lys Arg Lys Tyr Arg Val Cys
145 150 155 160
Asn Val Thr Arg Arg Pro Ala Ser His Gln Thr Phe Pro Leu Gln Gln
165 170 175
Glu Ser Gly Gln Thr Val Glu Cys Thr Val Ala Gln Tyr Phe Lys Asp
180 185 190
Arg His Lys Leu Val Leu Arg Tyr Pro His Leu Pro Cys Leu Gln Val
195 200 205
Gly Gln Glu Gln Lys His Thr Tyr Leu Pro Leu Glu Val Cys Asn Ile
210 215 220
Val Ala Gly Gln Arg Cys Ile Lys Lys Leu Thr Asp Asn Gln Thr Ser
225 230 235 240
Thr Met Ile Arg Ala Thr Ala Arg Ser Ala Pro Asp Arg Gln Glu Glu
245 250 255
Ile Ser Lys Leu Met Arg Ser Ala Ser Phe Asn Thr Asp Pro Tyr Val
260 265 270
Arg Glu Phe Gly Ile Met Val Lys Asp Glu Met Thr Asp Val Thr Gly
275 280 285
Arg Val Leu Gln Pro Pro Ser Ile Leu Tyr Gly Gly Arg Asn Lys Ala
290 295 300
Ile Ala Thr Pro Val Gln Gly Val Trp Asp Met Arg Asn Lys Gln Phe
305 310 315 320

His Thr Gly Ile Glu Ile Lys Val Trp Ala Ile Ala Cys Phe Ala Pro
 325 330 335
 Gln Arg Gln Cys Thr Glu Val His Leu Lys Ser Phe Thr Glu Gln Leu
 340 345 350
 Arg Lys Ile Ser Arg Asp Ala Gly Met Pro Ile Gln Gly Gln Pro Cys
 355 360 365
 Phe Cys Lys Tyr Ala Gln Gly Ala Asp Ser Val Gly Pro Met Phe Arg
 370 375 380
 His Leu Lys Asn Thr Tyr Ala Gly Leu Gln Leu Val Val Val Ile Leu
 385 390 395 400
 Pro Gly Lys Thr Pro Val Tyr Ala Glu Val Lys Arg Val Gly Asp Thr
 405 410 415
 Val Leu Gly Met Ala Thr Gln Cys Val Gln Met Lys Asn Val Gln Arg
 420 425 430
 Thr Thr Pro Gln Thr Leu Ser Asn Leu Cys Leu Lys Ile Asn Val Lys
 435 440 445
 Leu Gly Gly Val Asn Asn Ile Leu Leu Pro Gln Gly Arg Pro Pro Val
 450 455 460
 Phe Gln Gln Pro Val Ile Phe Leu Gly Ala Asp Val Thr His Pro Pro
 465 470 475 480
 Ala Gly Asp Gly Lys Lys Pro Ser Ile Ala Ala Val Val Gly Ser Met
 485 490 495
 Asp Ala His Pro Asn Arg Tyr Cys Ala Thr Val Arg Val Gln Gln His
 500 505 510
 Arg Gln Glu Ile Ile Gln Asp Leu Ala Ala Met Val Arg Glu Leu Leu
 515 520 525
 Ile Gln Phe Tyr Lys Ser Thr Arg Phe Lys Pro Thr Arg Ile Ile Phe
 530 535 540
 Tyr Arg Asp Gly Val Ser Glu Gly Gln Phe Gln Gln Val Leu His His
 545 550 555 560
 Glu Leu Leu Ala Ile Arg Glu Ala Cys Ile Lys Leu Glu Lys Asp Tyr
 565 570 575
 Gln Pro Gly Ile Thr Phe Ile Val Val Gln Lys Arg His His Thr Arg
 580 585 590
 Leu Phe Cys Thr Asp Lys Asn Glu Arg Val Gly Lys Ser Gly Asn Ile
 595 600 605
 Pro Ala Gly Thr Thr Val Asp Thr Lys Ile Thr His Pro Thr Glu Phe
 610 615 620
 Asp Phe Tyr Leu Cys Ser His Ala Gly Ile Gln Gly Thr Ser Arg Pro
 625 630 635 640
 Ser His Tyr His Val Leu Trp Asp Asp Asn Arg Phe Ser Ser Asp Glu
 645 650 655
 Leu Gln Ile Leu Thr Tyr Gln Leu Cys His Thr Tyr Val Arg Cys Thr
 660 665 670
 Arg Ser Val Ser Ile Pro Ala Pro Ala Tyr Tyr Ala His Leu Val Ala
 675 680 685
 Phe Arg Ala Arg Tyr His Leu Val Asp Lys Glu His Asp Ser Ala Glu
 690 695 700
 Gly Ser His Thr Ser Gly Gln Ser Asn Gly Arg Asp His Gln Ala Leu
 705 710 715 720
 Ala Lys Ala Val Gln Val His Gln Asp Thr Leu Arg Thr Met Tyr Phe
 725 730 735
 Ala

<210> 11
 <211> 66
 <212> PRT
 <213> Xenopus laevis

<400> 11

Pro Val Gly Ser Leu Gln Glu Leu Ala Val Gln Lys Gly Trp Arg Leu
 1 5 10 15
 Pro Glu Tyr Thr Val Ala Gln Glu Ser Gly Pro Pro His Lys Arg Glu
 20 25 30
 Phe Thr Ile Thr Cys Arg Val Glu Thr Phe Val Glu Thr Gly Ser Gly
 35 40 45
 Thr Ser Lys Gln Val Ala Lys Arg Val Ala Ala Glu Lys Leu Leu Thr
 50 55 60
 Lys Phe
 65

<210> 12

<211> 66

<212> PRT

<213> Homo sapiens

<400> 12

Phe Met Glu Glu Leu Asn Thr Tyr Arg Gln Lys Gln Gly Val Val Leu
 1 5 10 15
 Lys Tyr Gln Glu Leu Pro Asn Ser Gly Pro Pro His Asp Arg Arg Phe
 20 25 30
 Thr Phe Gln Val Ile Ile Asp Gly Arg Glu Phe Pro Glu Gly Glu Gly
 35 40 45
 Arg Ser Lys Lys Glu Ala Lys Asn Ala Ala Ala Lys Leu Ala Val Glu
 50 55 60
 Ile Leu
 65

<210> 13

<211> 818

<212> PRT

<213> Caenorhabditis elegans

<400> 13

Val Asn Glu Glu Ile Lys Val Gln Phe Ala Lys Asn Phe Val Tyr Asp
 1 5 10 15
 Asn Asn Ser Ile Leu Arg Val Pro Glu Ser Phe His Asp Pro Asn Arg
 20 25 30
 Phe Glu Gln Ser Leu Glu Val Ala Pro Arg Ile Glu Ala Trp Phe Gly
 35 40 45
 Ile Tyr Ile Gly Ile Lys Glu Leu Phe Asp Gly Glu Pro Val Leu Asn
 50 55 60
 Phe Ala Ile Val Asp Lys Leu Phe Tyr Asn Ala Pro Lys Met Ser Leu
 65 70 75 80
 Leu Asp Tyr Leu Leu Leu Ile Val Asp Pro Gln Ser Cys Asn Asp Asp
 85 90 95
 Val Arg Lys Asp Leu Lys Thr Lys Leu Met Ala Gly Lys Met Thr Ile
 100 105 110
 Arg Gln Ala Ala Arg Pro Arg Ile Arg Gln Leu Leu Glu Asn Leu Lys
 115 120 125
 Leu Lys Cys Ala Glu Val Trp Asp Asn Glu Met Ser Arg Leu Thr Glu
 130 135 140
 Arg His Leu Thr Phe Leu Asp Leu Cys Glu Glu Asn Ser Leu Val Tyr
 145 150 155 160
 Lys Val Thr Gly Lys Ser Asp Arg Gly Arg Asn Ala Lys Lys Tyr Asp
 165 170 175
 Thr Thr Leu Phe Lys Ile Tyr Glu Glu Asn Lys Lys Phe Ile Glu Phe
 180 185 190
 Pro His Leu Pro Leu Val Lys Val Lys Ser Gly Ala Lys Glu Tyr Ala
 195 200 205

Val Pro Met Glu His Leu Glu Val His Glu Lys Pro Gln Arg Tyr Lys
 210 215 220
 Asn Arg Ile Asp Leu Val Met Gln Asp Lys Phe Leu Lys Arg Ala Thr
 225 230 235 240
 Arg Lys Pro His Asp Tyr Lys Glu Asn Thr Leu Lys Met Leu Lys Glu
 245 250 255
 Leu Asp Phe Ser Ser Glu Glu Leu Asn Phe Val Glu Arg Phe Gly Leu
 260 265 270
 Cys Ser Lys Leu Gln Met Ile Glu Cys Pro Gly Lys Val Leu Lys Glu
 275 280 285
 Pro Met Leu Val Asn Ser Val Asn Glu Gln Ile Lys Met Thr Pro Val
 290 295 300
 Ile Arg Gly Phe Gln Glu Lys Gln Leu Asn Val Val Pro Glu Lys Glu
 305 310 315 320
 Leu Cys Cys Ala Val Phe Val Val Asn Glu Thr Ala Gly Asn Pro Cys
 325 330 335
 Leu Glu Glu Asn Asp Val Val Lys Phe Tyr Thr Glu Leu Ile Gly Gly
 340 345 350
 Cys Lys Phe Arg Gly Ile Arg Ile Gly Ala Asn Glu Asn Arg Gly Ala
 355 360 365
 Gln Ser Ile Met Tyr Asp Ala Thr Lys Asn Glu Tyr Ala Phe Tyr Lys
 370 375 380
 Asn Cys Thr Leu Asn Thr Gly Ile Gly Arg Phe Glu Ile Ala Ala Thr
 385 390 395 400
 Glu Ala Lys Asn Met Phe Glu Arg Leu Pro Asp Lys Glu Gln Lys Val
 405 410 415
 Leu Met Phe Ile Ile Ile Ser Lys Arg Gln Leu Asn Ala Tyr Gly Phe
 420 425 430
 Val Lys His Tyr Cys Asp His Thr Ile Gly Val Ala Asn Gln His Ile
 435 440 445
 Thr Ser Glu Thr Val Thr Lys Ala Leu Ala Ser Leu Arg His Glu Lys
 450 455 460
 Gly Ser Lys Arg Ile Phe Tyr Gln Ile Ala Leu Lys Ile Asn Ala Lys
 465 470 475 480
 Leu Gly Gly Ile Asn Gln Glu Leu Asp Trp Ser Glu Ile Ala Glu Ile
 485 490 495
 Ser Pro Glu Glu Lys Glu Arg Arg Lys Thr Met Pro Leu Thr Met Tyr
 500 505 510
 Val Gly Ile Asp Val Thr His Pro Thr Ser Tyr Ser Gly Ile Asp Tyr
 515 520 525
 Ser Ile Ala Ala Val Val Ala Ser Ile Asn Pro Gly Gly Thr Ile Tyr
 530 535 540
 Arg Asn Met Ile Val Thr Gln Glu Glu Cys Arg Pro Gly Glu Arg Ala
 545 550 555 560
 Val Ala His Gly Arg Glu Arg Thr Asp Ile Leu Glu Ala Lys Phe Val
 565 570 575
 Lys Leu Leu Arg Glu Phe Ala Glu Asn Asn Asp Asn Arg Ala Pro Ala
 580 585 590
 His Ile Val Val Tyr Arg Asp Gly Val Ser Asp Ser Glu Met Leu Arg
 595 600 605
 Val Ser His Asp Glu Leu Arg Ser Leu Lys Ser Glu Val Lys Gln Phe
 610 615 620
 Met Ser Glu Arg Asp Gly Glu Asp Pro Glu Pro Lys Tyr Thr Phe Ile
 625 630 635 640
 Val Ile Gln Lys Arg His Asn Thr Arg Leu Leu Arg Arg Met Glu Lys
 645 650 655
 Asp Lys Pro Val Val Asn Lys Asp Leu Thr Pro Ala Glu Thr Asp Val
 660 665 670
 Ala Val Ala Val Lys Gln Trp Glu Glu Asp Met Lys Glu Ser Lys
 675 680 685

Glu Thr Gly Ile Val Asn Pro Ser Ser Gly Thr Thr Val Asp Lys Leu
690 695 700
Ile Val Ser Lys Tyr Lys Phe Asp Phe Phe Leu Ala Ser His His Gly
705 710 715 720
Val Leu Gly Thr Ser Arg Pro Gly His Tyr Thr Val Met Tyr Asp Asp
725 730 735
Lys Gly Met Ser Gln Asp Glu Val Tyr Lys Met Thr Tyr Gly Leu Ala
740 745 750
Phe Leu Ser Ala Arg Cys Arg Lys Pro Ile Ser Leu Pro Val Pro Val
755 760 765
His Tyr Ala His Leu Ser Cys Glu Lys Ala Lys Glu Leu Tyr Arg Thr
770 775 780
Tyr Lys Glu His Tyr Ile Gly Asp Tyr Ala Gln Pro Arg Thr Arg His
785 790 795 800
Glu Met Glu His Phe Leu Gln Thr Asn Val Lys Tyr Pro Gly Met Ser
805 810 815
Phe Ala

<210> 14

<211> 63

<212> PRT

<213> Caenorhabditis elegans

<400> 14

Trp Val Gly Lys Leu Gln Phe Lys Ser Gln Lys Ser Lys Leu Gln Ala
1 5 10 15
Asp Ile Tyr Glu Asp Ser Lys Asn Glu Arg Thr Glu Phe Thr Leu Val
20 25 30
Ile Cys Thr Met Cys Asn Gln Lys Thr Arg Gly Ile Thr Ser Lys Gln
35 40 45
Lys Asp Ala Lys Asn Leu Ala Ala Trp Leu Met Trp Lys Ala Leu
50 55 60